

### **Remarks**

Claims 1 and 3-20 are in the application, of which claims 1, 6, 9, 14, and 20 are in independent form. Claim 2 is canceled, and claims 19 and 20 are new.

Claims 6-8 and 14-16 are objected to and would be allowable if rewritten in independent form. The stated reason for the indication of allowable subject matter is that, with respect to claims 6 and 14, the prior art of record fails to teach or suggest a plano exit surface with a liquid interface film resident at the plano exit surface. Accordingly, applicant has rewritten claim 6 in independent form to recite the subject matter of claim 1 and has rewritten claim 14 in independent form to recite the subject matter of claim 1 and intervening claim 10. (The subject matter of intervening claim 13, which recites a meniscus lens element that is not germane to the stated reason for allowability, is presented in new claim 19, which depends on independent claim 14.) Applicant submits, therefore, that claims 6-8, 14-16, and 19 are allowable.

Claim 1 and its dependent claim 18 stand rejected under 35 USC § 102(e) for anticipation by Shafer. Applicant has amended claim 1 to recite the subject matter of canceled claim 2. The amendment to claim 1 renders moot the anticipation rejection, and applicant requests that it be withdrawn.

Claims 4, 5, 9-13, and 17 stand rejected under 35 USC § 103(a) for obviousness over Shafer. Claims 2 and 3 stand rejected under 35 USC § 103(a) for obviousness over Shafer in view of Hagiwara. Applicant responds as follows to these rejections.

With respect to claim 9, applicant has rewritten it in independent form and submits that rewritten claim 9 is patentable because Shafer describes a catadioptric imaging system formed with at least one reflective optical element and operating over a 200 nm-400 nm wavelength range. In contrast, claim 9 recites a lens assembly in which all of the optical components of the first and second lens groups are formed of refractive lens materials and which has a numerical aperture of 0.9 for a specified wavelength of 157 nm. Applicant requests, therefore, that the obviousness rejection of claim 9 be withdrawn.

With respect to claims 3-5, 10-13, and 17, amended independent claim 1, on which claims 3-5, 10-13, and 17 depend, recites that the lens element substrate material of the optical components included in the first and second lens groups includes a specially doped fused silica substrate material. Applicant submits that Shafer's catadioptric imaging system including at least 18 lens elements constructed with the fluorine-doped silica glass of Hagiwara, as proposed by the Examiner, would form a highly light absorptive optical

train transmitting a nearly imperceptible amount of light. The proposed lens system would, therefore, render an unserviceable objective lens.

More specifically, the Shafer catadioptric imaging system shown in Fig. 4 is formed of at least 18 lens elements made of calcium fluoride and fused silica placed in an optical train of a microscope operating over a 200 nm-400 nm wavelength range. Shafer offers no suggestion of operating at a lower wavelength. Hagiwara merely mentions fluorine-doped silica glass as a reticle substrate material subjected to deep ultraviolet light used in an exposure apparatus. Neither Shafer nor Hagiwara contemplates the significant intrinsic birefringence effects of calcium fluoride at 157 nm, much less the use of modified fused silica to mitigate them. Applicant discusses these issues in paragraphs [0007] and [0008] of his patent application.

Assuming *arguendo* that a skilled person would have attempted to construct the Shafer catadioptric imaging system with fluorine-doped silica glass optical elements, the result would have been an imaging system transmitting a nearly imperceptible amount of light. The reason is that such a modified fused silica lens element of, for example, about 6 mm in thickness transmits about 85%-90% of incident light. An optical train of 18 modified fused silica lens elements would absorb nearly all of the incident light before it reaches an exit surface. A skilled person trying the proposed implementation of modified fused silica components would, therefore, have discovered the unacceptable result and abandoned the effort. Applicant's four embodiments use between three and nine optical elements and are amenable to the use of modified fused silica, as taught in the patent application.


Applicant contends, therefore, that a skilled person would not have undertaken the proposed combination of Shafer and Hagiwara and, even if the skilled person had done so, the result would have been an unserviceable objective lens. Applicant requests, therefore, that the obviousness rejections be withdrawn and amended claim 1 and its dependent claims 3-5, 10-13, and 17 be allowed.

Finally, applicant presents new claim 20, which recites the subject matter of original claim 1 and the limitation that all of the optical components of the first and second lens groups are formed of refractive lens materials. Claim 20 is neither anticipated by nor obvious over Shafer because it describes a catadioptric imaging system formed with at least one reflective optical element.

Applicant believes his application is in condition for allowance and respectfully requests the same.

Respectfully submitted,

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